Needle Pleural Biopsy

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We performed 32 pleural biopsies with the Ramel needle on 32 patients with pleural effusion of unknown origin. At least four samples of parietal pleural tissue were obtained, – three for histological and one for bacteriological study; the Löwenstein-Jensen medium was used for the culture. Before the pleural biopsy a diagnostic thoracentesis was performed. Pleural fluid in all cases was exudate (Light's criteria). Pleural fluid cytology was negative for malignant cells and lymphocytes were predominant. The pleural biopsy specimen provided a histological or bacteriological diagnosis in 20 patients (62%), of which 14 (44%) were diagnostic of neoplasia and 6 (19%) of pleural tuberculosis. The pleural biopsy specimen was nonspecific in 12 patients (37%). Complications occurred in 4 (12.5%) patients, of which all were vasovagal reactions. Needle pleural biospy is a safe procedure most useful when a prior thoracentesis has failed to establish a diagnosis, suspected malignant or tuberculous pleural effusion, and can be concidered to be the next diagnostic step after thoracentesis.

Key words: pleura, pleural fluid, pleural biopsy

INTRODUCTION

Percutaneous needle biopsy of the parietal pleura was first described in 1955 and has subsequently proved helpful in the diagnosis of tuberculous pleurisy (1, 2). Initial studies of pleural biopsy used tissue only for a histological study, and sensitivity for tuberculous pleurisy ranged from 40 to 80% (3–8). Later workers discovered the utility of tissue culture for mycobacteria as an adjunct to histological study, which may boost diagnostic sensitivity to 95% (3, 5).

Malignant pleural effusion can be diagnosed only by demonstrating malignant cells in pleural fluid or pleural tissue (9). Pleural fluid cytology in the diagnosis of malignant pleural effusion had a sensitivity of 40 to 90% and averages to about 62% (6, 8, 10–13). Most experts agree that when the initial evaluation of a pleural effusion is nondiagnostic, especially when neoplastic disease is suspected, parietal pleural biopsy should be considered (14).

Cytology is a more sensitive test for the diagnosis than percutaneous pleural biopsy (8, 13, 15, 16). The diagnostic yield on pleural biopsy increases as the disease becomes more advanced. It appears, based on thoracoscopy, that initial pleural metastases begin near the mediastinum and diaphragm; as the disease progresses, tumor spreads cephalad and costal (6, 9, 15). These blind percutaneous biopsies of the costal (parietal) pleura report a diagnostic yield of 39 to 75% and probably averages to about 45% (4, 6–10, 13, 15–20). The realatively low yield of blind pleural biopsy is due to several factors, including early stage of disease with minimal pleural involvement, distribution of tumor in areas not sampled during blind biopsy, and operator inexperience (8, 9, 13, 18).

Combined pleural biopsy with cytologic analysis of the pleural effusion was more beneficial than any single method in identifying malignant pleural effusions (16, 19). In one prospective study of 414 cases, U.B. Prakash and H.M. Reiman (16) found that the presence of pleural malignant disease was established by cytologic study in 162 patients (57.6%), by needle biopsy in 123 (43%), and by either cytologic analysis or biopsy in 182 (64.7%).

In malignant mesothelioma, specimens from closed needle biopsy are rarely of sufficient size and number to allow the full battery of immunohistochemical stains and electron microscopic examination for definitive diagnosis (7, 21). Cytologic analysis in malignant mesothelioma yields a sensitivity of 4 to 30% (21, 22).

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Several types of pleural biopsy needle are available: Cope, Abrams, Radja, Trucut, Ramel. There are no difference between the needles in relation to diagnosis (2, 23–25). Contraindications to pleural biopsy include bleeding diathesis, anticoaguliaton, chest wall infection, and lack of patient's cooperation. Important complications include pneumothorax, hemothorax, and vasovagal reactions. Postbiopsy pneumothoraces are frequently due to air entry from the needle during the procedure and often do not require intervention. Following pleural biospy a chest X-ray is rutinely performed to rule out iatrogenic pneumothorax, hemothorax. A rapid clinical deterioration or increased postprocedure effusion should alert the clinicians to possible hemothorax (2, 13).

MATERIALS AND METHODS

We performed 32 parietal pleural biopsies with the Ramel needle on 32 patients with pleural effusion of unknown origin. Sixteen of these patients were male (50%) and 16 were female (50%); the patients had an average age of 57 years (range, 25 to 77 years). Before pleural biopsy a diagnostic thoracentesis was performed. Pleural fluid (50 ml) was submitted for biochemical, cytologic, and bacteriologic studies (differential cell count; protein, glucose, pH and lactate dehydrogenase values; Ziehl–Nelsen staining; and culture in Löwenstein–Jensen medium). After local anesthesia with lidocain, a Ramel needle was advanced through an intercostal space and at least four samples of parietal pleural tissue were obtained, three for histological study (in 10% formalin) and one for bacteriological study (in sterile saline solution); the Löwenstein–Jensen medium was used for the culture. Atropin was not administered to prevent vasovagal reactions, although it was available to be administered subcutaneously at the first sign of such a reaction. Afterward a chest roentgenogram was routinely obtained.

RESULTS

Pleural fluid in all cases was exudative (Light's criteria (2)). Pleural fluid cytology was negative for malignant cells, and lymphocytes were predominant (>50% of all leucocytes). The second pleural fluid cytology (after pleural biopsy) was positive for malignant cells in one case (7%). An average of 7 samples of parietal pleural tissue was obtained. The results of pleural biopsy in 32 patients are given in Table 1. The pleural biopsy specimen provided a histological or bacteriological diagnosis in 20 patients (62%), of which 14 (44%) were diagnostic of neoplasia and 6 (19%) of pleural tuberculosis. The pleural biopsy specimen was nonspecific in 12 patients (37%). Histological and bacteriological diagnoses of parietal pleural tissue samples for tuberculosis are given in Table 2. Histologic examination revealed the presence of granulomas in 4 (67%) patients. Culture in Löwenstein-Jensen medium of the pleural biopsy specimen was positive in 2 (33%) patients. Histological diagnoses of parietal pleural tissue samples for malignancy are given in Table 3. Of the 14 pleural biopsies for malignancy with positive results, 8 (57%) were adenocarcinomas, 6 (43%) were lymphomas. Complications occurred in 4 (12.5%) patients; all of them were vasovagal reactions.

Table 1. **Results of pleural biopsy in 32 patients**

Diagnosis	n	%
Neoplasia	14	44
Tuberculosis	6	19
Nonspecific	12	37
Total	32	100

Table 2. **Histological and bacteriological diagnosis of parietal pleural tissue samples for tuberculosis**

Diagnosis	n	%
Histological (granuloma)	4	67
Bacteriological (Löwenstein–Jensen medium)	2	33
Total	6	100

Table 3. **Histological diagnosis of parietal pleural tissue samples for malignancy**

Histological diagnosis	n	%
Adenocarcinama	8	57
Lymphoma	6	43
Total	14	100

DISCUSSION

The primary two diagnoses that can be established with needle biopsy of the pleura are tuberculosis and malignancy (8).

Tuberculous pleurisy should always be considered in the patient with a lymphocyte-predominant exudate, with or without a positive tuberculin skin test. The yield from pleural biopsy culture and histology, in conjuction with pleural fluid culture and sputum smear and culture, probably provides a bacteriological diagnosis in up to 90 to 95% of cases. If the initial biopsy is nondiagnostic and the patient has tuberculous pleuritis, a second biopsy will be positive in 10 to 40% of cases (8).

In our series, pleural biopsy histology was more sensitive (granulomas present in 67% patients) when pleural tissue sample culture (culture was positive in 33% of patients) was used for the diagnosis of tuberculous pleurisy. The sensitivity of percutaneous needle biopsy for diagnosis of tuberculous pleurisy is highest when more than six specimens are obtained, which on average contain more than two specimens of parietal pleura. There are no conclusive data indicate how many tissue specimens should be submitted for mycobacterial culture, but one specimen seems sufficient. The optimal number or fraction of total pleural biopsy specimens that should be cultured is still unclear (5). The literature indicates that one specimen to 50% of all specimens should be cultured for mycobacteria (10, 26–27).

Therefore, thoracoscopy is usually unnecessary to establish the diagnosis of tuberculous effusion. A combined yield of only 6% for thoracoscopy preceded by negative thoracentesis and closed needle pleural biopsy has been reported (7). Even if diagnostic studies are negative, patients with a positive tuberculin test and an undiagnosed lymphocyte predominant exudate should be treated for tuberculous pleurisy because of a high risk (70%) of developing active pulmonary or extrapulmonary tuberculosis within 5 years if untreated (26).

In malignant pleural effusion percutaneous pleural biopsy should be reserved for the second thoracentesis, if the initial pleural fluid cytological examination is negative. If the second cytological examination and a initial pleural biopsy are negative, a third cytological examination and second pleural biopsy soon after usually are not diagnostic (9). In our study, from 14 pleural neoplasia a second pleural fluid cytology for malignant cells was obtained in one case (7%).

However, studies have shown that 7 to 12% of patients with malignant pleural effusions may be diagnosed by pleural biopsy when fluid cytology is negative. After pleural fluid analysis and closed needle biopsy more than 20% (in our series 37%) of effusions remained undiagnosed (13, 16). There are several options for the patient with suspected malignancy and negative pleural fluid and pleural tissue examination. These include: obseration for a few weeks wih repeated studies; thoracoscopy, or open pleural biopsy (2, 9).

In one prospective study of 208 cases, R. Loddenkemper and coworkers (16) found that thoracoscopy had a sensitivity of 95% compared with 44% for closed pleural biopsy and 62% for fluid cytology. When combined, all the methods are diagnostic in 97% of malignant pleural effusions. Similar results have been reported by other investigators (28–30). However, as the sensitivity of blind biopsy is limited, especially in pleural malignancy medical thoracoscopy may be indicated directly after diagnostic thoracentesis, which has a much higher diagnostic yield and gives an immediate therapeutic option (30).

Needle pleural biopsy is important in the diagnosis of pleural malignancy and tuberculosis and is a generally safe procedure; complications occurred in 12.5% of patients.

CONCLUSIONS

1. The pleural biopsies made with a Ramel needle provided a histologic or bacteriologic diagnosis in 62% patients, of which 42% were diagnostic of neoplasia and 20% were diagnostic of pleural tuberculosis.

2. Needle pleural biopsy is a generally safe procedure, complications occurred in 12.5% of patients.

3. Pleural biopsy can be the next diagnostic step after thoracentesis.

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References

1. Sahn SA. State of the art. The pleura. Am Rev Respir Dis 1988; 138: 184–234.
2. Light RW. Pleural Diseases. Baltimore: Williams and Wilkins 1995.
3. Tomlinson JR, Sahn SA. Invasive procedures in the diagnosis of pleural disease. Semin Respir Med 1987; 9: 30–6.
4. Poe RH, Israell RH, Utel MJ. Sensitivity, specificity, and predictive values of closed pleural biopsy. Arch Intern Med 1984; 144: 232–328.
5. Kirsh CM, Kroe DM, Azzi RL, Jesen WA, Kagawa FT, Wehner JM. The optimal number of pleural biopsy specimens for a diagnostic of tuberculous pleurisy. Chest 1997; 112: 702–6.
6. Strausz J. Pulmonary Endoscopy and Biopsy Techniques. European Respiratory Monograph 1998; 3: 269.
7. Colt HG. Thoracoscopy. Window to the pleural space. Chest 1999; 116: 1409–15.
8. Light RW. Diagnostic principles in pleural disease. Eur Respir J 1997; 10: 476–81.
9. Sahn SA. Pleural diseases releated to metastatic malignancies. Eur Respir J 1997; 10: 1907–13.
10. Bueno CE, Clemente G, Castro C, Martin M, Ramos SR, Panizo AG et al. Cytologic and bacteriologic analysis of fluid and pleural biopsy specimens with Cope's needle. Study of 414 patients. Arch Intern Med 1990; 150: 1190–4.
11. Motherby H, Nadjari B, Friegel P, Kohaus J, Ramp U, Bõcking A. Diagnostic accuracy of effusion cytology. Diagn Cytopathol 1999; 20: 350–7.
12. Malcolm M, Camp J, Mentzen SJ, Swanson SJ, Sugarbaker DJ. Malignant Effusive disease of pleura and pericardium. Chest 1997; 112: 291–5.

13. Management of Malignant Pleural Effusions. This Official Statement of the American Thoracic Society was adopted by the ATS Board of Directors. Am J Respir Crit Care Med 2000; 162: 1987–2001.
14. De Groot M, Walter G. Thoracoscopy in undiagnosed pleural effusions. S Afr Med J 1998; 88: 706–11.
15. Hsu C. Cytologic detection of malignancy in pleural effusion: a review of 5,255 samples from 3,811 patients. Diagn Cytopathol 1987; 3: 8–12.
16. Prakash UB, Reiman HM. Comparison of needle biopsy with cytologic analysis for the evaluation of pleural effusions: analysis of 414 cases. Mayo Clin Proc 1985; 60: 158–64.
17. Starr RL, Sherman ME. The value of multiple preparations in the diagnosis of malignant pleural effusions. Acta Cytol 1991; 35: 533–7.
18. Canto A, Rivis J, Saumench J, Morera R, Moya J. Points to concider when choosing a biopsy method in cases of pleurisy of unknown origin. Chest 1983; 84: 176–9.
19. Loddenkemper R, Grosser H, Gabler A. Prospective evaluation of biopsy methods in the diagnosis of malignant pleural effusions: inpatient comparison between pleural fluid cytology, blind needle biopsy and thoracoscopy. Am Rev Respir Dis 1983; 127 (suppl 4): 114.
20. Ogirala RG, Agarwal V, Vizioli LD, Pinsker KL, Aldrich TK. Comparison of the Raja and the Abrams pleural biopsy needles in patients with pleural effusion. Am Rev Respir Dis 1993; 14: 1291–4.
21. Renshaw AA, Dean BR, Antman KH, Sugarbaker DJ, Cibas AA. The role of cytologic evaluation of pleural fluid in the diagnosis of malignant mesothelioma. Chest 1997; 111: 106–9.
22. Boutin C, Rey F. Thoracoscopy in pleural malignant mesothelioma: a prospective study of 188 consecutive patients. Cancer 1993; 72: 389–93.
23. Cristopher DJ, Peter JV, Cherian AM. Blind pleural biopsy using a Tru–cut needle in moderate to large pleural effusion – an experience. Singapure Med J 1998; 39: 196–9.
24. Mc Leod DT, Ternouth Y, Nkanza N. Comparison of the Tru-cut biopsy with Abrams punch for pleural biospy. Thorax 1989; 44: 794–6.
25. Morrone N, Algranti E, Barreto E. Pleural biopsy with Cope and Abrams needles. Chest 1987; 92: 1050–2.
26. Silver MR, Bone RC. The technique of closed pleural biopsy: how to get the best results with either the Cope or Abrams needle. J Crit Illness 1988; 3: 53–60.
27. Walsh LJ, Mac Farlance JT, Manhire AR. Audit of pleural biopsies: an argument for a pleural biopsy service. Respir Med 1994; 88: 503–5.
28. Charbonneau MR. Thoracoscopy for the diagnosis of pleural disease. Am Intern Med 1991; 114: 271–6.
29. Mc Lean AN, Bicknell SR, Mc Alpine LG, Peacock AJ. An evaluaton of the new Olympus LTF semiflexible. Thoracofiberscope and comparison with Abram's needle biopsy. Chest 1998; 114: 150–3.
30. Loddenkemper R, Boutin C. Thoracoscopy: present diagnostic and therapeutic indications. Eur Respir J 1993; 6: 1544–55.

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ADATINĖ PLEUROS BIOPSIJA

S a n t r a u k a

Trisdešimt dviem ligoniams sergantiems neaiškios kilmės pleuritu, atlikome pleuros biopsijas su Ramel adata. Buvo imami mažiausiai keturi parietalinės pleuros gabalėliai: trys histologiniam ir vienas mikrobiologiniam ištyrimui. Pasėliams naudotos Löwenstein-Jensen terpės. Prieš pleuros biopsiją buvo atliktos diagnostinės pleuros ertmės punkcijos. Visų ligonių pleuros skystis buvo eksudatas (pagal Laito kriterijus). Pleuros skystyje nustatytas padidėjęs bendras limfocitų skaičius ir nerasta maligninių ląstelių. Histologinis ir mikrobiologinis pleuros bioptatų tyrimas padėjo nustatyti diagnozę 20 (62%) ligonių: 14 (44%) neoplaziją ir 6 (19%) tuberkuliozę. Dvylikai (37%) ligonių pleuros bioptato tyrimas buvo nespecifinis. Keturiems (12,5%) ligoniams procedūros metu pasireiškė vazovagalinės reakcijos. Adatinė pleuros biopsija yra saugi ir svarbi procedūra diagnozuojant maligninį pleuros procesą ar tuberkuliozę. Ji rekomenduojama tuomet, jei, atlikus pleuros ertmės diagnostinę punkciją, diagnozė lieka neaiški.

Raktažodžiai: pleura, pleuros skystis, pleuros biopsija